

*7 Page* ADVANCE PRESS PROOF  
FROM FORTHCOMING 1965 CATALOG  
*28 Page*

## A COMPLETE LINE OF SOLID-STATE MULTI-RANGE VOLTMETERS

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For  
Those Who  
Are Perfectly  
Satisfied With Their  
Present Voltmeters,  
But ...

# SOLID-STATE, MULTI-RANGE

IF YOU ARE PERFECTLY SATISFIED  
WITH YOUR PRESENT VOLTMETER,

*but  
You  
prefer:*

- Smaller, perhaps unusual sizes with uncompromising performance
- Portability and light weight
- No down-time reliability
- Militarized construction at sensible prices
- More, related measurements in less space

... then the Theta Voltmeter Series can surely fill your exact needs.

## TRI-VOLTER SERIES

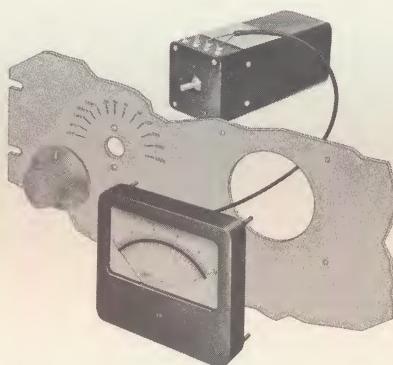
A versatile, new multimeter which combines the voltage-measuring capabilities of the Phase-Sensitive Voltmeter, AC Voltmeter, and DC Voltmeter. Also provides direct-reading of phase shift through 360°.



SEE PAGE 12

## MODULAR SERIES

Built-in, midget voltmeters—AC, DC, or Phase-Sensitive—provide laboratory performance in the smallest possible space. These panel-mounted modules are preferred by console designers.



SEE PAGE 14

## CUSTOM SERIES

Choose any combination of off-the-shelf voltmeter modules — AC, DC, Phase-Sensitive — in a variety of physical formats. Provision for phase-shift measurements can also be included.



SEE PAGE 17

## BASIC SPECIFICATIONS

### AC Voltmeters (TRVM)

Sensitivity .... 1 MV full scale  
Accuracy ..... 2%  
Input Impedance . 2 megohms  
Ranges .. 1 MV through 300 V  
in 12 steps

### DC Voltmeters (DCVM)

Sensitivity ... 10 MV full scale  
Accuracy ..... 2%  
Input Impedance . 5 megohms  
Ranges . 10 MV through 300 V  
in 10 steps

### Phase-Sensitive Voltmeters (PSVM)

Sensitivity .... 1 MV full scale  
Accuracy ..... 2%  
Input Impedance . 2 megohms  
Ranges .. 1 MV through 300 V  
in 12 steps

# VOLTMETERS

## NOTEWORTHY FEATURES ON ALL THETA VOLTMETERS

### **FASTEST RESPONSE**

Input signals which differ considerably in amplitude are rapidly read upon Theta voltmeters. For example, should a particular scale be saturated with 300 V and then a 1 MV signal inserted — the transients will settle out in less than half-a-second. Thus, a sequence of voltage measurements is actually performed in a shorter time.

### **OVERLOAD IMMUNITY**

Up to 350 V may be continuously inserted at the voltmeter input — even on the 1 MV scale — without any damage whatever to either the circuit or the meter movement.

### **DC OUTPUTS FOR EXTRA TASKS**

DC output from the voltmeter can be used to drive a relay, recording device, or digital voltmeter.

### **RUGGED CONSTRUCTION**

Withstands the extreme environmental conditions of most military specifications for ground support equipment. Printed circuit boards conform to the most rigorous NASA requirements.

### **SOLID-STATE RELIABILITY**

Fully transistorized design and conservative ratings assure longer life, less maintenance, less power drain, and more stability than vacuum tube counterparts. These instruments are ready for instant operation without warmup.

### **AVOIDS GROUND-LOOP ERRORS**

The signal and power circuits are fully isolated one from the other (except in the case of 28 V DC power options). If desired, leads may be commoned thus enabling you to carry wires to a single point for grounding.

### **DRAMATIC SPACE SAVINGS**

Through the use of miniature circuit components and negligible power dissipation, Theta voltmeters represent the smallest size consistent with easy operation and convenient maintenance.

### **EASY TO SERVICE**

Four facts simplify servicing of Theta voltmeters:

1. Full trouble-shooting data is furnished
2. Test points are readily accessible
3. All circuit boards are replaceable
4. All circuit boards are repairable

### **SENSIBLE PRICES**

Starting at \$320, Theta voltmeters are competitively priced. Included in the standard price is virtually full militarization. Operating, maintenance, and provisioning data accompanying each voltmeter will satisfy most military requirements.

### **COMPLETELY SELF-CONTAINED**

Power packs are never required — all power conversion is built-in. Outside attenuators are not needed — that too is integral.

### **COMPLETE DOCUMENTATION**

Available with each voltmeter is a 52 page manual covering theory, operation, maintenance, calibration, and spare parts. In its standard format, it will satisfy the data requirements of most military contracts.

### **PROVEN CIRCUITRY**

Theta voltmeters have achieved standards of dependability in major weapon-support systems. Stability and accuracy have been maintained under difficult and often unpredictable field conditions.

**ALL NEW, PORTABLE**

**3  
IN  
1**

**PHASE-SENSITIVE  
VOLTMETER  
AC VOLTMETER  
DC VOLTMETER**

**Theta's TRI-VOLTER is the first multimeter of its kind. In one compact instrument, you can measure with precision and ease:**

- voltage ratios
- power factor
- DC voltages
- impedance
- phase shift
- total AC voltages
- in-phase voltages
- nulls from AC bridges
- synchro/resolver nulls
- fundamental AC voltages
- quadrature voltages
- nulls from DC bridges
- transducer nulls



**TRIPLE YOUR MEASUREMENT CAPABILITIES WITH THETA TRI-VOLTER**

**MEASURES ABSOLUTE VOLTAGES**

AC, DC, and phase-modulated voltages are measured with an accuracy of 2% of full scale. The high-resolution, 6-inch meter scale lets you take full advantage of circuit precision.

**DIRECT-READING PHASE SHIFT MEASUREMENTS**

The phase shift (or phase difference) of a single-frequency signal with respect to a reference is directly displayed on a single dial. Measures any angle, 0° through 360°, continuously without the need to move decade switches.

**NULLED WITHOUT SCALE CHANGING**

As a null indicator (AC, DC, and phase-sensitive), the TRI-VOLTER provides a truly unique feature: scales need not be changed. In the null mode, a nonlinear circuit prevents off-scale indication. For example, you may choose to use the 1 MV range. Even though the nulling voltage varies between zero and 350 volts (AC or DC), its variation will appear on the meter without changing the position of the range switch. In the null vicinity, of course, full sensitivity is automatically restored.

**NUMEROUS APPLICATIONS**

- Laboratory
- Service
- Production Test
- Field Test
- System Support

**GO COMPARISON SHOPPING**

TRI-VOLTER performance equals or exceeds that of the best rival instruments. Yet, it occupies less space, has fewer controls, and costs less than equivalent phase-sensitive-voltmeters alone. It is the only instrument to offer the 3-IN-1 feature and the NULL-ABSOLUTE mode selection feature.

## SPECIFICATIONS

**Applies To All Operating Modes:**

Attenuator Ranges	1 MV to 300 V in 12 steps (1 MV, 3 MV not operable in DC mode).
Overload	300 V AC or DC applied indefinitely at any setting.
Meter Scale	6 in. meter; 3-0-3 & 10-0-10 scales.
Overload Indicator	Lamp glows at 5X full-scale voltage.
Power Required	115V, 50-800 cps.
Functions	Phase-sensitive voltmeter, AC voltmeter, DC voltmeter, phase-shift.
Null Mode	Selected by panel switch. Non-linear scale with full sens. in vicinity of 0; 300 V FS. Use with any range switch setting.
Dimensions	8 in. high x 11 in. wide x 10 in. deep.
Circuit	Solid-State.

**Phase-Sensitive Voltmeter Section**

Input Impedance	2 megohm min. on 1 MV, 3 MV, 10 MV, 30 MV scales; 4 megohm min. or others.
Accuracy	Within 2% of full scale.
Resolution	10 microvolts.
Full-Scale Sensitivity	1 MV.
Operating Frequency	400 cps nominal.
Reference Required	115 V $\pm$ 10%, 400 $\pm$ 1 cps, 15 ma. Internal phase-shifter adjustable through 360°.
Quadrature Rejection	250 to 1.

**Isolation** ..... Signal and reference inputs are isolated, but may be commoned.

**Harmonic Rejection** ..... 40 db.  
**Overload Capacity** ..... Full accuracy with 5X overload.

**AC Voltmeter Section**

<b>Input Impedance</b>	2 megohm min. on 1 MV, 3 MV, 10 MV, 30 MV scales; 4 megohm min. on others.
<b>Accuracy</b>	Within 2% of full scale.
<b>Resolution</b>	10 microvolts.
<b>Full-Scale Sensitivity</b>	1 MV.
<b>Frequency</b>	30 cps to 20 KC.
<b>Circuit Type</b>	Measures average AC; scale calibrated RMS for sine-wave input.
<b>Filter</b>	400 cps band-pass filter inserted or removed via front-panel switch.

**DC Voltmeter Section**

<b>Input Resistance</b>	5 megohms min.
<b>Polarity Indication</b>	Marked on zero-centered scale.
<b>Accuracy</b>	Within 2% of full scale.
<b>Resolution</b>	100 microvolts.
<b>Full-Scale Sensitivity</b>	10 MV.

**Phase Generator Section**

<b>Reference Required</b>	115 V $\pm$ 10%, 400 $\pm$ 1 cps.
<b>Phase Range</b>	0° - 360°, continuous, no stops.
<b>Phase Accuracy</b>	1°.

**Fully Militarized TRI-VOLTER  
Per MIL-T-21200B, Class 2**

- Drip-proof
- Passes shock test
- 4½" ruggedized meter
- Passes vibration
- -40°C to +55°C operating
- MIL components
- Passes 100% humidity

Size, 6.7 in. wide x 8.4 in. high x 6.5 in. deep. Wt., 7½ lbs.

**Write for Bulletin 3-90**

**ORDERING INFORMATION**

<b>TRI-VOLTER:</b>	Model No. T-1
<b>Price:</b>	\$1,200
<b>Delivery:</b>	60 days
<b>Shipping Wt.:</b>	20 lb. approx.
<b>Warranty:</b>	1 year
<b>F.O.B.:</b>	Saddle Brook, N. J.
<b>Terms:</b>	Net 30 days

*Many other custom modifications are available.*

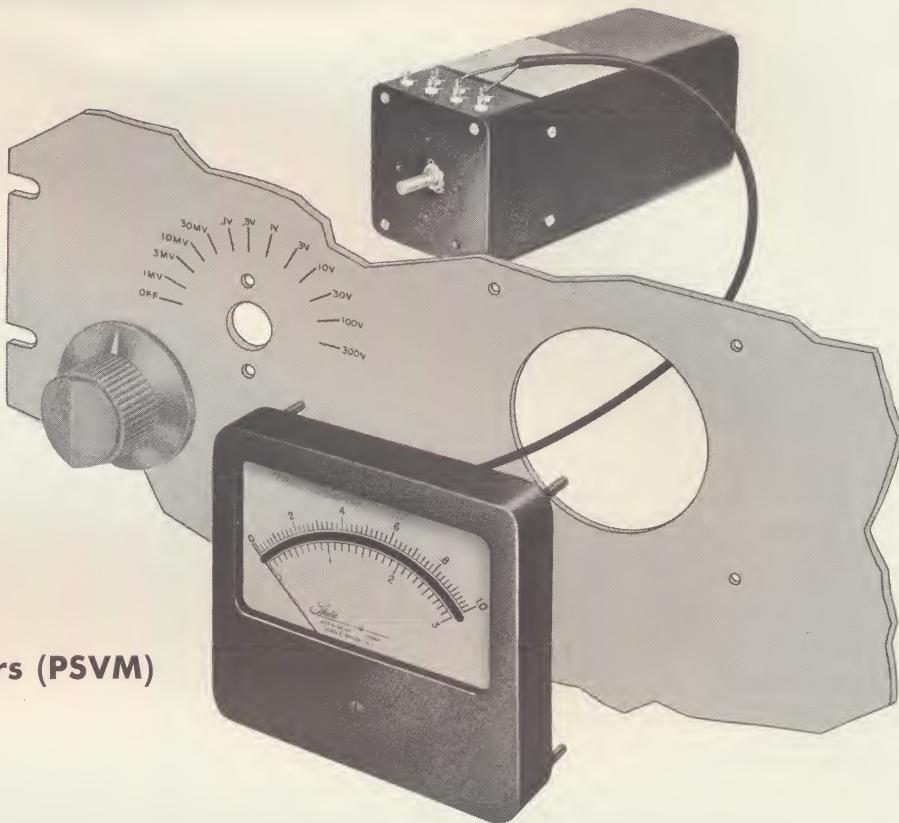
# PANEL-MOUNTED

Theta's panel-mounted voltmeters are sophisticated instruments which have been reduced to component simplicity. These modules are built into all kinds of test systems to simplify operation, conserve space, and enhance appearance.

Only the range switch protrudes through the panel. As a result, there need be no concern about matching finishes, knobs, or markings. Locate the meter (any style) to suit your human engineering and packaging requirements.

## AVAILABLE AS

- **AC Voltmeters (TRVM)**
- **Phase-Sensitive Voltmeters (PSVM)**
- **DC Voltmeters (DCVM)**



## FEATURES

### SMALLEST, PANEL-MOUNTED METERS EVER PRESENTED

With two easy-to-mount sections, panel space is most efficiently used. Mount the meter alongside, above, below, or away from the electronic package.

### HUMAN ENGINEERED

Many designed-for-use panels require meters at eye level and controls at hand level. Only with Theta solid-state voltmeters can this be done.

### NEAT APPEARANCE

Theta voltmeters are built-into your test panels. Problems of matching paint finishes, knobs, markings, and meter movements to the rest of your test system have been eliminated. Since the meter movement is a separate element, a style and size may be chosen to match the other panel meters being used.

### CHOOSE YOUR OWN METER STYLE

Theta stocks three sizes of rectangular, mirror-scale meter movements for use with solid-state voltmeters. Separation of electronics and meter allows the choice of any meter (electrical parameters must conform).

### FRONT-PANEL MAINTENANCE

Gain calibration is rarely required — when it is, merely insert a screwdriver through an access hole from the front of your panel.

### FULL DOCUMENTATION

A 52 page Instruction Manual accompanies each order. It covers installation, operation, maintenance, theory, and provisioning. At no additional charge, it satisfies most military data requirements.

# VOLTMETER MODULES

## SPECIFICATIONS

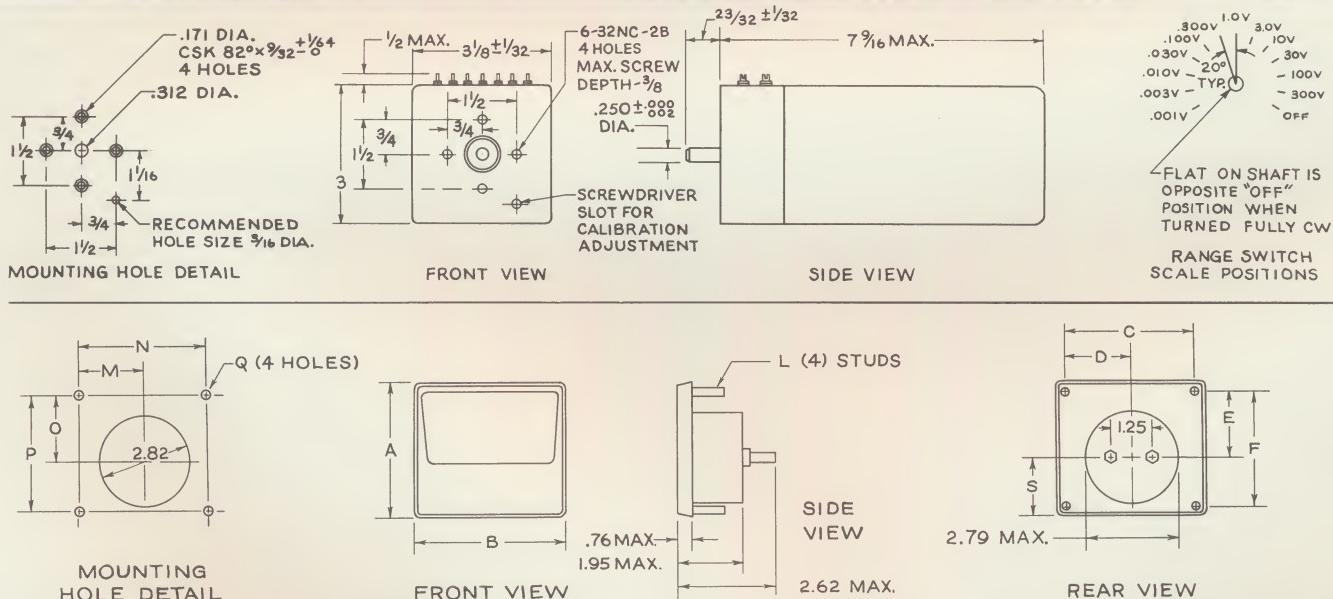
	Phase-Sensitive Voltmeter, Model PSVM <sup>5</sup>	AC Voltmeter, Model TRVM	DC Voltmeter, Model DCVM
Full-Scale Deflection <sup>1</sup>	1 MV		10 MV
Input Impedance	2 Meg $\Omega$ on 1 MV, 3 MV, 10 MV, 30 MV scales; others, 4 Meg $\Omega$		5 Meg $\Omega$
Accuracy <sup>2</sup>	2% FS		2% FS
Ranges	1 MV — 300V, 12 steps		10 MV — 300V, 10 steps
Frequency Response	60 cps — 2000 cps <sup>4</sup>		60 cps — 20Kc
Resolution <sup>3</sup>	5 microvolts		10 microvolts
Reference Required	1 only, 26V or 115V, signal freq.; 50 K $\Omega$ input		None
DC Output	$\pm$ 60 MV across 600 $\Omega$		$\pm$ 60 MV across 600 $\Omega$
Signal Overload	No damage with 350V AC or DC applied indefinitely on any range		
Power Required	115V $\pm$ 5%, 60-800 cps, 100 ma. max.		
Isolation	Complete isolation between pwr, sig., ref. inputs		

1. With range switch in most sensitive position  
 2. Includes meter-movement error  
 3. With 6-inch meter movement  
 4. Freq. resp. is 200 cps — 2 KC with 115V reference option

5. PSVM Options  
 Signal Filter: Bandpass; 3 db down at  $\pm$ 7% of nominal freq.; 40db down at 3rd harm.  
 Overload Alarm: DPDT relay, 2 amp contacts. Energized when signal exceeds 2X FS.

### NOTES

## OUTLINE DRAWINGS



THETA PART NO.	DIM A	DIM B	DIM C	DIM D	DIM E	DIM F	THD L	DIM M	DIM N	DIM O	DIM P	DIM Q	DIM S
C-759-1 C-770-1	3.12	3.27	2.250	1.125	1.125	2.250	#4-40 x .62	1.12	2.25	1.12	2.25	.125	1.60
C-759-2 C-770-2	4.26	4.71	4.000	2.000	2.020	3.560	#6-32 x .62	2.000	4.000	2.020	3.560	.156	189
C-759-3 C-770-3	4.36	5.75	5.250	2.625	2.150	3.000	#6-32 x .62	2.625	5.250	2.150	3.000	.156	1.69

MORE ON PAGE 16

# HUNDREDS OF CUSTOM VOLTMETERS ASSEMBLED FROM OFF-THE-SHELF MODULES

## Combine Several Different Voltmeters In A Special Package At Moderate Cost and Rapid Delivery

Custom voltmeters to suit your exact needs are rapidly produced by Theta through use of the many panel-mounted modules shown throughout this catalog. Whether the need is for special physical layout or for multi-purpose voltmeters, modules are rapidly and economically integrated into a single compact instrument. Any of the voltmeters shown on pages 12 — 16 as well as the Phase Generators shown on pages 20 — 26 may be incorporated in the custom voltmeter.

### Features:

- One, two, three, or four discrete voltage-measuring functions are combined in a single instrument to meet your requirements.
- Instruments are mounted and housed in packages to suit your equipment needs.
- Rapid delivery of custom designs.
- Complete operating, calibration, servicing, and provisioning data supplied at no extra cost.

## NINE BASIC VOLTMETER COMBINATIONS TO CHOOSE FROM



PSVM = Phase-Sensitive Voltmeter

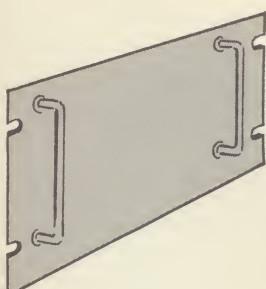
TRVM = AC Voltmeter

DCVM = DC Voltmeter

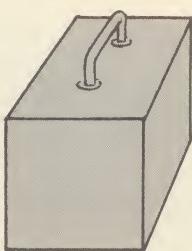
PG = Phase Generator

Performance characteristics of modular voltmeters are given on page 15; phase generators, page 25. Each module of the custom voltmeter can be specified with the many options which are also listed on the above pages.

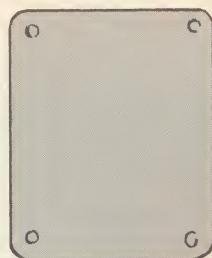
## FIVE PACKAGING FORMATS TO CHOOSE FROM



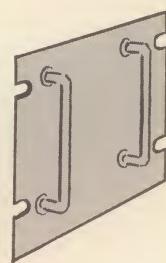
Standard 19 in. panel



Portable Case



Panel Insert



Standard 9 1/2 in. panel



Transit Case

### STANDARD PHYSICAL SPECIFICATIONS

Panel Material ..... Al, 3/16 in.  
Finish ..... Light gray baked enamel  
Markings ..... Black  
Power Controls  
ON-OFF Switch, Indicator Light, Fuse

### OTHER PHYSICAL VARIATIONS

- Engraved Panel-Markings
- Special Finish
- Special Connectors
- Drip-Proofing
- Ruggedized Meter Movements